CDM

Illinois Environmental Protection Agency

Southeast Rockford Groundwater Contamination Superfund Site Source Area 7 Pre-Design Sampling and Analysis Plan

August 16, 2004

Final Report

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1 Section One

Section 1
Introduction

1.1 Objectives of Sampling Program

This Sampling and Analysis Plan (SAP) describes the field activities required for the Southeast Rockford Groundwater Contamination Superfund site, Source Area 7 Remedial Design (Area 7 RD) Pre-Design Field Study. The objectives of the sampling program are as follows:

- Conduct aerial and ground surveys, and prepare current topographic base map to support the Area 7 RD
- Collect soil gas and soil samples in the northern portion of Area 7 to support remedial design development
- Installation of new monitoring wells, and repair and redevelopment of existing Area 7 monitoring wells to ensure adequate current groundwater quality data to support the Area 7 RD
- Collect groundwater data to support development of the Area 7 leachate control and groundwater treatment systems

1.2 Sampling Team Responsibilities

Field sampling will be performed by Camp Dresser & McKee Inc. (CDM). The project organization chart is shown in the Southeast Rockford Area 7 Pre-Design Quality Assurance Project Plan (QAPP) Addendum. Responsibilities of the sampling team are described below.

Field Manager

The Field Manager (FM) will be responsible for assigning the sampling team responsibilities (in conjunction with the Site Manager), as well as overseeing all field activities. The FM will coordinate mobilization and demobilization for the CDM sampling team, as well as for any subcontractors. The FM will be responsible for keeping the Site Manager up to date on all sampling and subcontractor activities.

Sampling Team Leader

The Sampling Team Leader (STL) will be responsible for the sampling efforts, will assure the availability and maintenance of all sampling equipment and materials, and will maintain an adequate supply of shipping and packing materials. The STL will supervise the completion of all chain-of-custody records, the proper handling and shipping of the samples collected, be responsible for the accurate completion of field

log books, and provide close coordination with the Field Data Coordinator (FDC) and the FM. The STL or FM will be present whenever samples are collected.

Sampling Team Member(s)

The Sampling Team Member(s) (STM) will perform field measurements, collect samples, prepare samples for shipping, and decontaminate sampling equipment as directed by the STL.

Field Data Coordinator

The Field Data Coordinator (FDC) will remain in the support area and will accept custody of samples from the sampling team. The FDC will be responsible for the completion of all chain-of-custody and sample traffic control forms. The FDC will also be responsible for maintaining communications with on-site personnel and off-site laboratory personnel, as well as for logging all communications and site entries and departures.

Site Health and Safety Coordinator (SHSC)

The SHSC is responsible for daily supervision and documentation of all safety, decontamination, environmental monitoring and field medical monitoring activities. The SHSC is responsible for assuring that all field personnel comply with the provisions of the CDM Health and Safety Assurance Manual and site Health and Safety Plan (HSAM/HSP). The SHSC has the authority to suspend site work if conditions become unsafe, if HSAM/HSP requirements are not met, or if he/she determines that an upgraded level of protection may be required. The SHSC has the authority to restrict access to exclusion zones to personnel designated by CDM or Illinois EPA. The SHSC is responsible for designating and marking restricted areas during various site activities and for redesignating these areas when it is appropriate to do so.

Safety Technician

The Safety Technician (a designated member of the sampling team) will assist with sampling, aid other sampling team members with the donning and doffing of protective clothing, decontamination of sample containers and equipment, and will be available to replenish miscellaneous supplies, such as ice and vermiculite, as needed. The Safety Technician will report directly to the SHSC in health and safety related duties and will assume the responsibilities of the SHSC in the event of his/her absence from the site or in an emergency.

1.3 Scope of Sampling Activities

The scope of sampling activities detailed by this plan includes various phases of collection and analysis that will be performed during this investigation. A maximum of 86 soil gas samples will be collected from up to 43 locations for onsite analysis of

target volatile organic compounds (VOCs). The list of target VOCs established for this project include target VOCs include 1,1,1-trichloroethane (TCA), 1,1-dichloroethane (1,1-DCA), tetrachloroethene (PCE), trichloroethene (TCE), cis- and trans-1,2-dichloroethene (c- and t-1,2-DCE), 1,1-dichloroethene (1,1-DCE), chloroform, vinyl chloride (VC), and benzene, toluene, ethylbenzene, and xylenes (BTEX).

Based on this information, up to thirty soil samples will be collected for Target Compound List (TCL) VOC analysis through the U. S. Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP). Up to five groundwater samples will be collected from temporary well points for onsite analysis of target VOCs. Using this information, a maximum of three new monitoring wells will be installed in Area 7. Groundwater samples will be collected from the 3 new and 25 existing wells in and adjacent to Area 7 for analysis of low detection limit (LDL) TCL VOCs through USEPA CLP.

Table 1-1 provides a summary of the sampling and analysis program. The actual number of samples collected for analysis during the Area 7 Pre-Design will depend on the results of the screening level field activities; as a result, the actual numbers of borings and wells installed, or samples collected will likely vary somewhat from those given in this SAP, or in the Work Plan and QAPP Addendum. Any variations will be described in the Technical Memorandum.

Table 1-1
Summary of Sampling and Analysis Program
Southeast Rockford Area 7 Pre-Design Field Study

				QC Samples[2]		
Sample Matrix	**Field Parameters**	**Laboratory Parameters**	**Investigative Samples[1]**	**Field Duplicates[6]**	**Field Blank**	**Matrix Total**
Soil Gas Samples collected during geoprobe work	Field GC for target VOCs[8]	None	86	6	6	98
Groundwater Samples from temporary geoprobe points	pH, conductivity, temperature Field GC for target VOCs[8]	CLP Volatile Organics[2,3,4,5] SOW OLC03.2	5	1	1	7
Subsurface soil samples collected during geoprobe work	Qualitative organic vapor screening with PID or OVM	CLP RAS Volatile Organics[3,4,5] SOW OLM04.2	30	3	1	34
Subsurface soils collected during well installation	Qualitative organic vapor screening with PID or OVM	CLP RAS Volatile Organics[3,4,5] SOW OLM04.2	6	1	1	8
Groundwater from new and existing monitoring wells	pH, conductivity, temperature, turbidity, dissolved oxygen	CLP ICP-AES Target Analyte List (TAL) total and dissolved metals[3] SOW ILM05.2	3	1	1	5
		CLP Volatile Organics[2,3,4,5] SOW OLC03.2	28	3	3	34

1. Frequency of collection for all investigative and QC samples is 1.
2. One trip blank will be shipped with each cooler containing aqueous samples for VOC analysis.
3. Contract Laboratory Program SOW OLM04.2 and OLC03.2 volatile compounds and SOW ILM05.2 metals are listed in Appendix A of the QAPP Addendum
4. Double sample volume is required for soil and groundwater matrix spike/matrix spike duplicate (MS/MSD) samples.
5. MS/MSDs will be collected at frequency of one per group of 20 or fewer samples for volatile organic analysis.
6. Field blanks for soil samples consist of rinsate blanks-collected at a frequency of one per day (total number of blanks is estimated).
7. The number of samples to be collected for MS/MSD is not included in the matrix total. The number of trip blank samples is not included in the matrix total.
8. Target VOCs in include 1,1,1-trichloroethane (TCA), 1,1- dichloroethane (1,1-DCA), tetrachloroethene (PCE), trichloroethene (TCE), cis- and trans-1,2-dichloroethene (c- and t-1,2-DCE), 1,1-dichloroethene (1,1-DCE), chloroform, vinyl chloride (VC), and benzene, toluene, ethylbenzene, and xylenes (BTEX).

2 Section Two

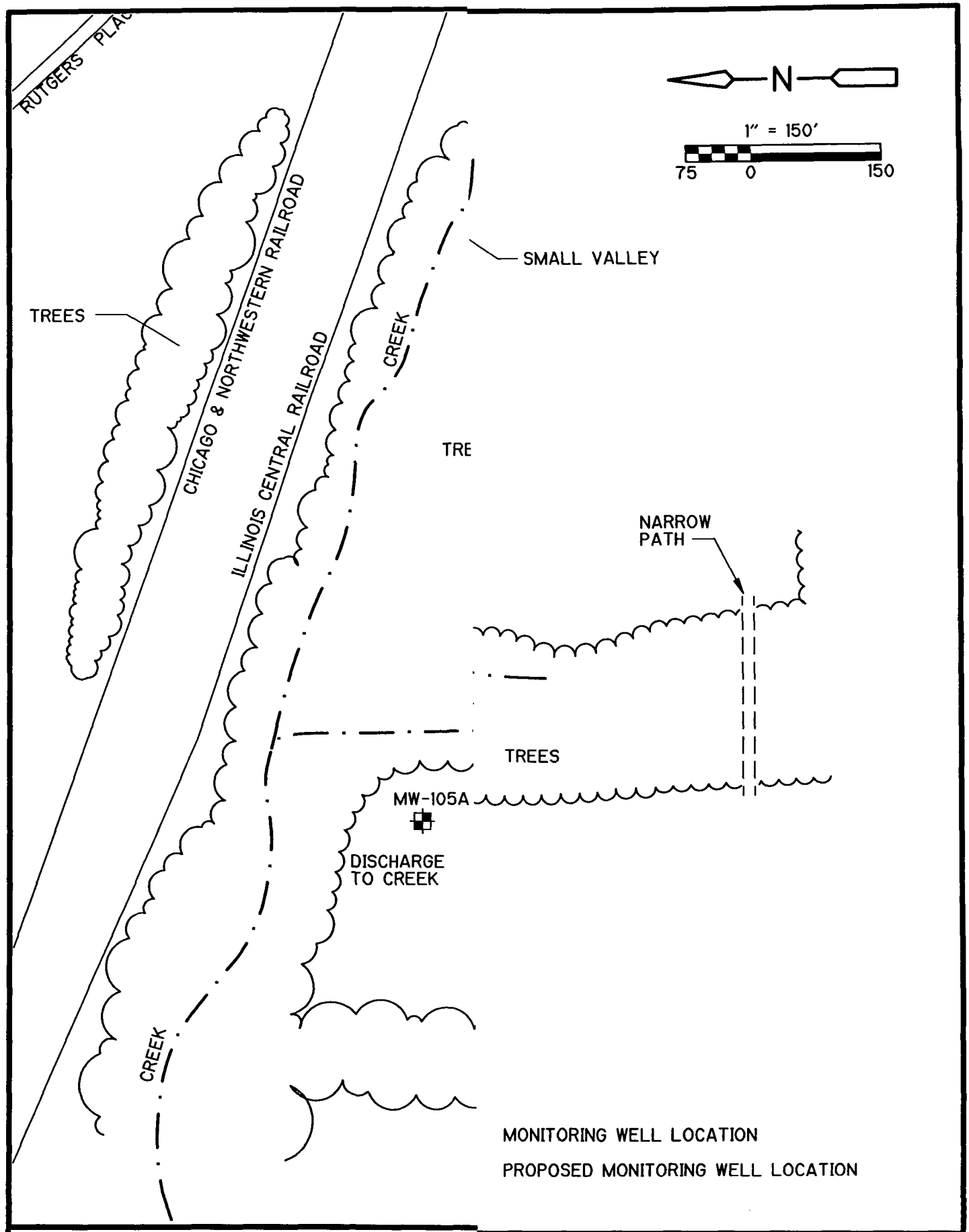
Section 2
Project Description

2.1 Area 7 Remedial Design

Source Area 7 is primarily a grassy area located at the eastern end of Balsam Lane. Area 7 contains Eckberg Park and an open area containing some woodlands. The park includes a basketball court, tennis court and a playground. The open field and wooded areas are located south of the park on a hillside, which slopes to the north. Two small valleys merge at the base of the hill where surface water drains to an intermittent creek which runs along the north side of Area 7. Residences border the area to the west and southwest (downgradient) and distantly to the east (upgradient). Parts of Area 7 were once used as gravel pits. Review of aerial photographs and reports from private citizens indicates that illegal dumping likely occurred in Area 7.

The stratigraphy of Area 7 consists of a heterogeneous assemblage of unconsolidated and discontinuous sands, silts, and clays that overlie dolomite bedrock. This type of geology is consistent with the past reports of quarrying. An east-west trending buried bedrock valley roughly parallels the present-day creek valley. Groundwater flow in both the unconsolidated and bedrock aquifers is to the northwest, with localized discharge of shallow groundwater to the creek. Depth to groundwater ranges from 36 feet south of the park, to 13 feet within the park to less than 2 feet near the creek.

Based on previous site investigation results, elevated concentrations of ethylbenzene, toluene, xylene and chlorinated VOCs were detected in soils in Area 7. These investigations identified three primary VOC source areas or "hot spots" in Area 7. These primary areas of contamination are shown as the shaded areas on Figure 2-1. The depth to significant levels of contamination varies from 4 feet below ground surface (bgs) in the northern area to 27-29 feet bgs in the northern and southern locations. Contamination is present in the soils both above and below the water table. Many of the silt and clay units encountered during the studies were found to be contaminated throughout indicating that the contamination has migrated into the less permeable, fine-grained sediments in Area 7. The presence of non-aqueous phase liquids (NAPL) is strongly suspected in all of these areas and was confirmed at a depth of 25 feet below ground surface in the northernmost "hot spot", which is 10 feet below the level of the water table. The contamination in the subsurface in Area 7 is impacting the groundwater and local surface water and is contributing to the Southeast Rockford Groundwater Contamination Site.



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CDM
environmental engineers, scientists, planners, & management consultants

FIGURE 2-1
(FORD GROUNDWATER CONTAMINATION SUPERFUND SITE SOURCE AREA 7
)ESIGN SAMPLING AND ANALYSIS PLAN

RY AREAS OF CONTAMINATION
SOURCE AREA 7

Based on remedial investigations and site-specific risk assessment, Remedial Action Objectives (RAOs) were developed. The Area 7 RAOs provide a general description of what the remedial action will accomplish and are as follows:

- Prevent the public from ingestion of soil, and direct contact with soil containing contamination in excess of state or federal standards or that poses a threat to human health
- Prevent the public from inhalation of airborne contaminants in excess of state or federal standards or that pose a threat to human health
- Prevent the further migration of contamination from Area 7 that would result in degradation of site-wide groundwater or surface water to levels in excess of state or federal standards, or that pose a threat to human health or the environment
- Prevent the public from ingestion and direct contact with surface water containing contamination in excess of state or federal standards or that pose a threat to human health
- Prevent the migration of contamination from Source Area 7 that would result in degradation of surface water and sediment in the unnamed creek to levels in excess of state or federal standards or that pose a threat to human health or the environment
- Prevent the ingestion of vegetables from Source Area 7 through the implementation of appropriate institutional controls

A number of potential remedial action alternatives for Area 7 were developed and evaluated based on RAOs, remediation goals, and comparative evaluation criteria. The detailed comparative analysis of Area 7 remedial alternatives is discussed in detail in the Record of Decision (ROD). Based on the comparative analysis, the remedy selected for Area 7 includes institutional controls, soil vapor extraction and air sparging in source areas, , and leachate containment and treatment.

3 Section Three

Section 3
General Sampling Information

Collection, preservation, documentation, and shipping of samples analyzed through the USEPA CLP (soil and groundwater samples) will be carried out in accordance with *Contract Laboratory Guidance for Field Samplers* (OSWER 9240.0-035, EPA 540-R-00-003). The guidance is included in **Appendix A**. Site-specific sampling information is included in the following sections. However, the sampling procedures will follow all applicable guidelines in the field sampling guidance and are not limited to the information provided in Section 3.

The Field Manager will fax a USEPA Region 5 Monthly Projection Form to the CLP Regional Sampling Control Coordinator (RSCC) by the 15th of the month prior to sampling. The Field Manager will fax a USEPA Region 5 Weekly Confirmation Form to the CLP Regional Sampling Control Coordinator (RSCC) no later than 12:00 noon on the Tuesday before the sampling week for Routine Analytical Services (RAS) sample collection shipments to CLP. The Field Manager will notify the RSCC of any last-minute changes in the sampling schedule.

3.1 Sample Containers and Preservation

All soil and groundwater samples will be collected in laboratory-decontaminated sample bottles and jars provided by the Illinois Environmental Protection Agency (Illinois EPA) Bottle Repository. Containers for samples that require preservative will be pre-preserved by the manufacturer. At soil boring locations and groundwater sampling locations, concentrations of contaminants are anticipated to be either low or medium concentrations as designated by the USEPA CLP. Sampling, handling, and shipping of the samples will be performed in accordance with these anticipated concentrations.

A summary of soil and water sample containers, their size and construction material, sample matrix, and holding times is given in **Table 3-1**. Sample collection will be performed in accordance with Appendix C of *Contract Laboratory Guidance for Field Samplers* (OSWER 9240.0-035, EPA 540-R-00-003). Internal laboratory QC requirements for analytical samples are discussed in Section B.5 of the Area 7 Pre-Design QAPP Addendum.

The sample containers and their preservation will be as follows:

Table 3-1
Sample Volumes, Containers, and Preservation Techniques
Low and Medium Concentration

Analysis	Container	Preservative	Maximum Holding Time	Volume of Sample	Matrix
Target Analyte List (TAL) Metals (total and dissolved)	One 1-liter high-density polyethylene bottle (field filtered sample) One 1-liter high-density polyethylene bottle (unfiltered sample)	HNO_3 to pH<2; cool, 4°C (DO NOT FREEZE)	180 days	Fill bottle to 1 liter of volume	Water
Volatiles	Three 5-g EnCore™ Samplers, one 60-ml glass jar	Cool to 4°C	24 hours*	Fill completely	Soil
Volatiles	Two 40-ml volatile organic analysis (VOA) vials	Pre-preserved vials (HCl) to pH<2; cool, 4°C	7 days	Fill completely (no air bubbles)	Water

* = Sample must reach laboratory within 24 hours.

3.1.1 Soil Gas Samples

- One pre-sterilized Tedlar bag will be filled with soil gas at each sampling location
- A glass syringe will be used to sub-sample the Tedlar bag contents
- Syringe samples will be injected into an on-site gas chromatograph for analysis
- A second pre-sterilized Tedlar bag will be filled and sub-sampled at sampling locations designated for duplicate analysis

3.1.2 Groundwater Samples

- Two 1-liter polyethylene bottles (pre-preserved with nitric acid) will be collected at three groundwater sampling locations for Target Analyte List (TAL) metals analysis. An unfiltered sample for total metals analysis will be placed in one bottle. A field-filtered sample for dissolved metals analysis will be placed into the second bottle. This sample will be filtered during collection using an in-line filter from the pump discharge tubing.
- Two 40-ml glass VOA vials (pre-preserved with hydrochloric acid) will be collected at each groundwater sampling location for volatile organic analysis.
- At sample collection points where duplicate samples will be collected, double sample volume for volatile organics and metals will be supplied to the designated lab for analysis.
- All water samples will be cooled at 4°C in an iced cooler following individual sample collection.

3.1.3 Soil Samples

In the following discussion, low-concentration samples refer to subsurface soil samples collected during Geoprobe boring.

- Low-concentration soil samples collected for volatile organics analysis will be collected in three 5-gram EnCore™ Samplers and one 60-ml glass jar.
- At sample collection points where matrix spike/matrix spike duplicates (MS/MSD) samples will be collected, double the sample volume will be collected.
- All soil samples will be cooled at 4°C in an iced cooler following individual sample collection.

3.2 Sample Holding Times

The sample holding times for soil and water samples are listed on **Table 3-1**. To expedite sample analysis, the samples will be shipped to the laboratory (CLP) via an overnight carrier (i.e., Federal Express) on the day of sample collection.

3.3 Sample Packaging and Shipment

Following sampling, the sample bottle exteriors will be decontaminated near the sampling location, or rinsed with potable or distilled water prior to shipment. The Field Manager will help the Field Data Coordinator prepare documentation and package sample bottles for shipment according to the following procedures:

- Check for proper sample preservation; tighten sample bottle caps securely and seal with tape; mark liquid levels if bottles are partially full.
- Make sure traffic report labels and sample labels/tags are securely attached to the sample container; place each container in a zip-loc baggie, ensuring that labels can be read.
- Place containers in a cooler lined with two inches of perlite or equivalent absorbent material; maintain at 4°C with cold packs or ice sealed in plastic bags; fill remaining space in cooler with additional packing material.
- Place completed chain-of-custody forms and traffic reports in a zip-lock baggie and tape to inside of cooler lid.
- Close cooler and seal with strapping tape; if cooler has a drain port, seal it with tape; place one custody seal across closure at front of cooler and across hinge area at back of cooler, or rear side corner.
- Affix airbill with shipper's and consignee's addresses to top of cooler; place "This End Up" labels appropriately. Restricted article airbills will be used in shipping medium and high-concentration samples.

Collected and packaged samples will then be shipped to the designated laboratory.

Upon shipment of samples to the CLP Laboratory, the Field Data Coordinator will call the Sampling Coordinator (before 5:30 p.m. central time on the day of shipment or early the following morning). The Sampling Coordinator must be notified by 2:00 p.m. on Friday for shipments to the CLP for Saturday delivery/pick-up. The Sampling Coordinator will be provided with the following information:

1. Samplers name and phone number where they can be reached
2. Case numbers

3. Name of laboratory(ies)

4. Date of shipment

5. Carrier, airbill number

6. Number, concentration and matrices of samples shipped

7. Information regarding changes and delays pertaining to the activity

The Traffic Report/Chain of Custody (TR/COC) form will be used to record this information. The TR/COC will be prepared using the USEPA Forms II Lite software program. An example of this form is shown in the CLP field sampling guidance (refer to **Appendix A**). A copy will be sent to the RSCC.

3.4 Chain-of-Custody Procedures

Chain-of-custody will be maintained throughout the sample preparation procedure as described in the Southeast Rockford Area 7 Pre-Design QAPP Addendum. Preparation of sample labels/tags, TR/COC preparation, and sample packaging/shipping procedures for CLP samples will be performed in accordance with the USEPA document *Contract Laboratory Guidance for Field Samplers* (OSWER 9240.0-035, EPA 540-R-00-003). A copy of the guidance is included in **Appendix A**.

3.5 Documentation

This section outlines the documentation required for all field activities, sample collection, handling and shipment to be conducted during the Area 7 Pre-Design Field Study.

3.5.1 Field Log Books

Field log books will provide the means of recording pertinent data collected during the performance of RI activities. As such, entries will be described in as much detail as possible so that site personnel can reconstruct a particular situation without reliance on memory.

Field log books will be bound, field survey books. Log books will be assigned to field personnel, but will be stored in the document control center when not in use. Each log book will be identified by the project-specific document number.

The title page of each notebook will contain:

- Person or Organization to whom the book is assigned
- Book Number

- Project Name
- Start Date
- End Date

Entries into the log book will contain a variety of information. At the beginning of each entry, the date, start time, weather, name of all team members present, level of personal protection being used, and the signature of the person making the entry will be recorded. The names of visitors to the site, field sampling or investigation team personnel and the purpose of their visit will be recorded in the field log book. At the end of each day's activity, the log will be closed with the time and signature of the person making the last entry (log-closed line). The log-closed lines and the following log-open lines will be placed so that no unauthorized entries can be made between entries.

Measurements made and samples collected will be recorded. All entries will be made in ink and no erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark, dated, and initialed by the person making the correction.

Wherever a sample is collected or a measurement is made, a detailed description of the location of the station, which may include compass and distance measurements, shall be recorded. The number of the photographs taken of the station with a brief description including and the direction faced will be noted. All equipment used to make measurements will be identified, along with the date of calibration.

The equipment used to collect samples will be noted, along with the time of sampling, sample description, depth at which the sample was collected, volume and number of containers. Sample location identifiers will be assigned prior to sample collection. Duplicates, which will receive a separate USEPA sample number, will be noted under sample description.

3.5.2 Sample Identification System

USEPA Sample Number

Each sample being sent to the CLP for analysis must have a USEPA case number and a sample number, regardless of the laboratory to which it is going. The RSCC will assign a case number for the sampling event. A new case number will be assigned approximately every two weeks. The RSCC will also provide a series of sample numbers to be used during the sampling events. The sample numbers typically consist of the letters "E" (USEPA code for Region 5 organic samples) or "ME" (USEPA code for Region 5 inorganic samples) followed by four to six numerical digits. A sample number will be automatically assigned to each sample by the Forms II Lite

program. Sample numbers will only be required for the samples submitted to a CLP laboratory (soil and groundwater samples).

Station Name/ Location Identification
In addition to the sample number, each soil and groundwater sample will also be assigned a station name and station location in accordance with Forms II Lite requirements. The station name ID assigned to each sample collected in Area 7 will be "A7".

The first two letters of the station location ID denotes the sample matrix. The number portion of the location ID will correspond to the sampling location designations. Sample matrices will be recorded using the following code:

SAMPLE MATRIX	CODE
Groundwater (monitoring well)	MW
Soil (Geoprobe)	GP
Soil Gas (Geoprobe)	SG
Groundwater (Geoprobe)	GW

Subsurface soil samples collected during the Area 7 Pre-Design Field Study will have up to six alphanumeric characters. The first two letters will be the sample code. The next two to three numbers will correspond to the soil boring or geoprobe location within the source area. Soil borings or geoprobes will have a two-digit designation. The letter suffix will document what depth the sample was collected from, with the letter "A" will representing a shallow, 8-10 feet bgs sample, and "B" a sample from the second depth interval approximately 18-20 feet bgs..
An example of a soil sample collected from a geoprobe soil boring is as follows:

A7-GP-16A

This identifier denotes a soil sample that would have been collected in Area 7 from soil boring GP-16 at the first sampling interval (for most soil borings, the 8 to 10-foot sample). In general, subsurface soil samples will be collected at depth intervals of 8 to 10 feet bgs and 18 to 20 feet bgs. In addition to the letter suffix entered in the station location, the specific depth range that samples are collected from will be recorded to the nearest foot in the appropriate area of the station location information (i.e. 10-11 feet or 11-12 feet).

Groundwater samples from new and existing monitoring wells will be assigned a station location ID identical to the name of the monitoring well from which the sample was taken. Groundwater samples for onsite analysis will be assigned a sequential two digit number station location ID as provided by this SAP.

For all sample matrices a final one-letter suffix in parentheses will be added for duplicate or field blank samples. For instance, GP-01B(D) would represent a duplicate collected for soil sample GP-01B; the suffix "(R)" would represent a field blank for a groundwater sample.

Sample designations will be recorded in the sample field book, on the chain-of-custody forms, the traffic reports, the sample identification record form, and on the sample tags affixed to the sample jars.

3.6 Sample Documentation Forms

TR/COC forms for CLP samples will be completed using the UESPA Forms II Lite Version 5.1 software. Preparation of the forms will be performed in accordance with the Forms II Lite operating instructions and the EPA guidance *Contract Laboratory Guidance for Field Samplers* (Refer to **Appendix A**.)

TR/COC forms will be assigned a number by the Forms II Lite program. In the event that a document is voided, it will not be destroyed; instead, voided sample documents will be saved and returned to the RSCC. Copies of the multiple-copy forms will accompany samples to the laboratory. The other copies will be sent to the RSCC immediately following sampling shipment.

A) Traffic Report/Chain-of-Custody Form

1) One form per shipping container (cooler) will be used

2) Separate forms will be used for organic and inorganic samples.

3) Carrier service will not need to sign form if custody seals remain intact

4) Will be used for all samples

B) Chain-of-Custody Seals

1) Two seals per shipping container will be used to secure the lid and provide evidence that samples have not been tampered with

2) Seals will be covered with clear tape

3) Seal numbers will be recorded on Chain-of-Custody Form

4) Seals will be used for all sample shipping containers

5) The STL or FM will sign and date each custody seal

C) Sample Tags

1) A sample container from each sampling location will have a Sample Tag affixed to it with string or wire

2) The station name, station location, date, time, analysis required, preservative, and type of sample (grab/composite) will be recorded on the sample tag

3) The CLP sample number will be entered on the sample tag, and will be cross-referenced with the sample labels

4) Traffic Report number and Case Number will be recorded in "Remarks" section of tag

5) Sample Tag Numbers will be recorded on Chain-of-Custody Forms

The TR/COC will be sealed in a plastic bag that is taped to the inside of the cooler lid. Copies of the TR/COC will be retained for the field files.

The sample handling technician will maintain lists cross-referencing site sample numbers, custody tag number, analyses to be performed, custody seal number, shippers' airbill numbers, and consigned laboratories in a bound log book using black ink.

4 Section Four

Section 4
Sampling Locations and Rationale

4.1 Area 7 Investigation

Soil gas, soil, and groundwater samples will be collected from Area 7 to obtain data for use in preparation of the Area 7 RD. The field investigation activities to be performed are described in the following subsections.

4.1.1 Geoprobe Soil Gas Samples

Soil gas sampling will be conducted in the northern portion of Area 7 as shown on Figure 4-1. This area was previously identified as needing further characterization. Previous investigations did not fully confirm the extent of areas of VOC contamination in the subsurface to the north of the playground and south of the creek. Additionally, the areas where recent dumping of debris has occurred will be investigated. A CDM subcontractor will use a direct push rig to collect soil gas samples at up to 43 locations within the grid area shown on **Figure 4-1.** Sampling may not be possible at all identified locations due to the presence of surface debris. Sample locations will be adjusted in the field as necessary based on field conditions. Soil gas sample depths will vary depending on the depth to groundwater. The shallow soil gas sample depth will be 8 to 10 feet below ground surface (bgs) or just above the water table if water is encountered shallower that 8 feet bgs. The deep soil gas sample interval will be from 18 to 20 feet bgs. At some locations, this interval may not be sampled due to depth to groundwater or the presence of clay layers. Shallow groundwater is expected as the soil gas sample locations proceed to the northern portion of the area. Soil gas samples will be analyzed on-site for target VOCs.

4.1.2 Geoprobe Soil Samples

Based on the results of the soil gas sampling, soil sampling locations and depths will be selected. A maximum of 30 soil samples will be collected using direct push technology for TCL VOC analysis by USEPA CLP. Samples will be collected in Encore samplers provided by Illinois EPA. The sample locations will be selected to confirm detections of VOCs in the soil gas. The locations with the highest concentrations of VOCs in soil gas will be sampled. Some of the sample intervals may be within the shallow 8 to 10 feet bgs interval and some may be in the deeper 18 to 20 feet bgs interval.

In the absence of a sufficient number of soil gas detections to guide soil sampling, CDM will collect soil samples from the water table at judgmentally and randomly selected locations. The rationale for selecting these locations will be documented in the field logbook. Finally, three duplicate samples at a rate of one duplicate sample per 10 or fewer investigative samples will also be collected and analyzed by USEPA CLP for QA/QC purposes.

4.1.3 Geoprobe Groundwater Samples

Groundwater screening samples will be collected in the southwestern portion of Area 7 as shown on Figure 4-1. The purpose of this sampling is to evaluate groundwater quality in the area proposed for the extraction well system, which will be downgradient of the primary source areas, and to confirm that shallow groundwater in the southwestern portion of the site is not currently influenced by the soil contamination in Area 7. The results of this groundwater sampling will be used to locate up to two additional monitoring wells that will be on the downgradient side of the proposed extraction well system. Five shallow groundwater samples will be collected using a Geoprobe® Screen Point 15 temporary well point groundwater sampler. Prior to sampling, a depth-to-water measurement will be taken from nearby monitoring wells MW135 and MW 106 and the groundwater elevations will be determined. The groundwater samples will be collected approximately 10 feet below the assumed groundwater table. For the purposes of this SAP, depth to groundwater is assumed to range from approximately 25 feet bgs to 35 feet bgs.

The five groundwater samples will be analyzed on site for target VOCs. One duplicate sample and one field blank sample will be collected and analyzed for QA/QC purposes.

All groundwater samples from this area will also be analyzed by CLP for LDL TCL VOCs to confirm the on site analyses.

4.1.4 Groundwater Samples

4.1.4.1 Monitoring Well Development and Repair

CDM proposes sampling of all existing and new monitoring wells in Area 7. Construction details for existing monitoring wells is provided below. The newly installed monitoring wells will be developed by the drilling subcontractor. The existing wells that were not sampled recently may need to be redeveloped in order to obtain a useable groundwater sample. Many of the wells have been inactive for over 5 years and sediment may have accumulated in the wells and filter pack. In addition to development of the newly installed wells, CDM's drilling subcontractor will re-develop, at a minimum, existing monitoring wells including MW103B, C, and D; MW105C and D; MW106B and C; MW112B and C; and MW134C in Area 7.

Area 7 Pre-Design Sampling
Southeast Rockford

Well Number	Depth to Screen Base*	Top of Screen Elevation	Bottom of Screen Elevation	Screen Length	Aquifer Screened	Top of Casing Elevation	Static Water Elevation
MW103B	75	725.4	715.4	10	bedrock	792.39	775.0
MW103C	107.9	692.3	682.3	10	bedrock	792.35	775.0
MW103D	200.5	599.7	589.7	10	bedrock	790.39	755.0
MW105C	95	698.5	688.5	10	unconsolidated	785.66	783.0
MW105D	156.8	637.3	627.3	10	bedrock	786.21	782.0
MW106B	86.4	727.0	717.0	10	bedrock	805.59	786.0
MW106C	119.4	694.0	684.0	10	bedrock	805.46	787.0
MW112B	95	715.3	705.3	10	bedrock	803.05	795.0
MW112C	300	510.2	500.2	10	sandstone	802.83	688.0
MW134C	63	741.2	736.2	5	unconsolidated	799.11	785.0

All measurements in feet, elevations are in feet above mean sea level (AMSL).
* Depth to base of screen is distance from ground surface to base of screen.

Some of the well completion components of the existing monitoring wells in and around Area 7 are in need of repair. The existing monitoring wells will be inspected during site mobilization to determine which wells require repair.

4.1.4.2 Monitoring Well Installation and Sampling

CDM proposes to install up to three new wells in Area 7. One of the wells will be located adjacent to existing well MW135 as shown on Figure 4-1. MW135 terminates at the surface of the dolomite. It is screened in the unconsolidated with the screen straddling the water table. In dry periods, this well is dry. The new well, MW135 B will be screened in the dolomite with a 10-foot screened interval. The exact screened interval will be determined in the field using a field instrument to screen for organic vapors. The total depth of this well is not expected to exceed 80 feet bgs.

A minimum of one and maximum of two additional shallow wells will be placed in the southwestern portion of Area 7, in the area where the groundwater screening locations are shown on Figure 4-1. Based on the results of the groundwater screening, well(s) will be located to monitor the shallow groundwater moving downgradient from the area proposed for the extraction well system for Area 7. The maximum depth of these wells is anticipated to be 50 feet bgs as the wells will be screened in the unconsolidated formation just above the dolomite.

CDM will sample up to 25 existing wells in Area 7. These include MW102A, B, C; MW103A, B, C, D; MW105A, B, C, D; MW106A, B, C; MW112A, B, C; MW133A, B, C; MW134A, B, C; MW135A; and MW136. Additionally, the three new monitoring wells described above will be sampled.

However, monitoring wells MW102A, B, C; MW133A, B, C; and MW136 are currently sampled by the City of Rockford's consultant, Nationwide Environmental Services, Inc. (NES), as part of a semi-annual groundwater monitoring program. CDM, in consultation with Illinois EPA and USEPA, will review NES planning documents (to determine if differences between NES and CDM in sample collection and analysis methods, as well as sampling schedule, can be managed to produce an acceptable level of data set comparability. If so, CDM will not sample the MW102, MW133, and MW136 well clusters.

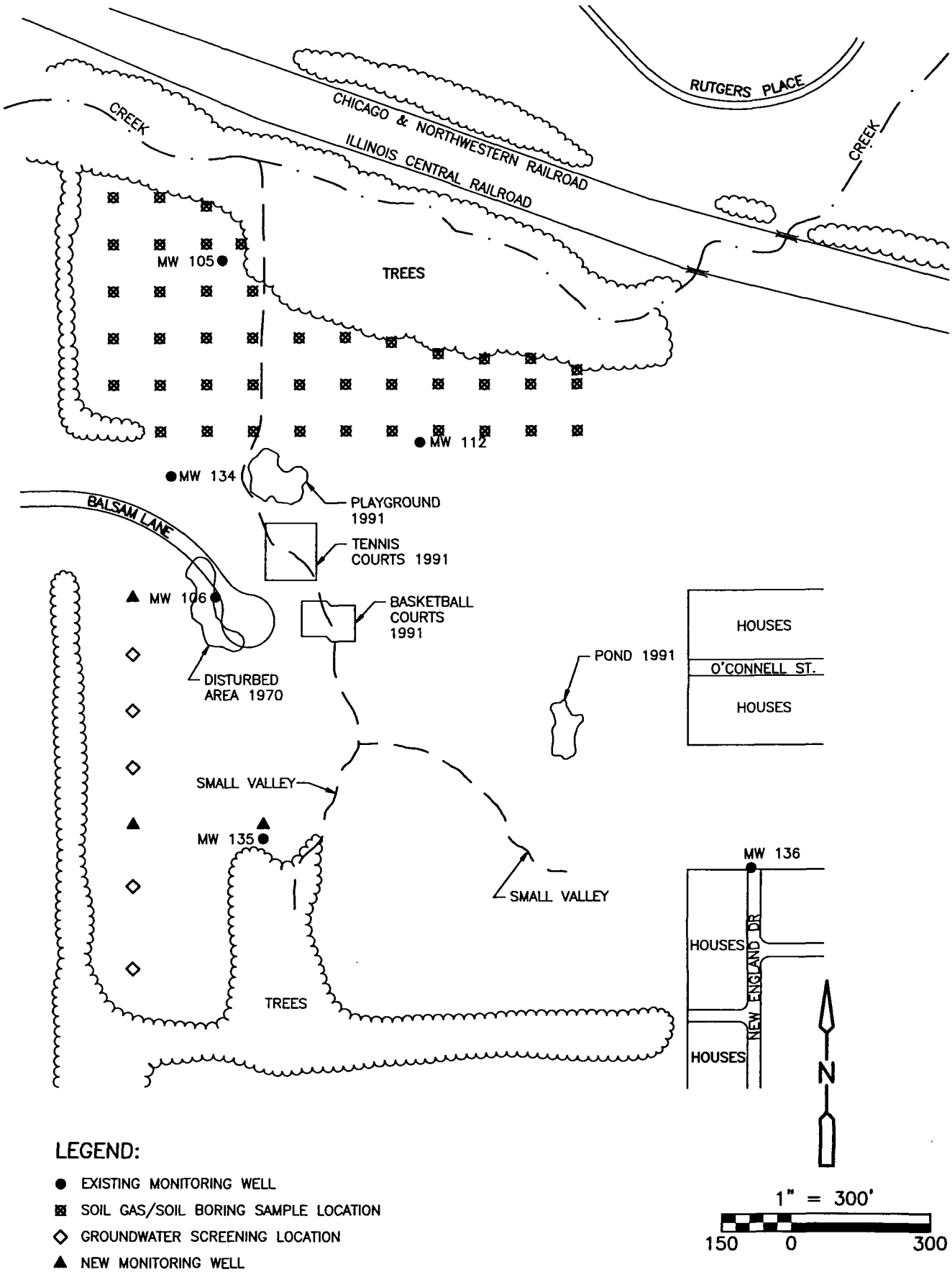

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Figure 4-1
Sampling and Analysis Plan
AREA 7 PRE-DESIGN SAMPLING LOCATIONS

CDM

5 Section Five

Section 5
Sampling Equipment and Procedures

5.1 Geoprobe Soil Gas Samples

A soil gas survey for VOCs will be conducted to further identify areas of subsurface VOC contamination to the north of the playground in Area 7 and to assist with locating soil sample locations. A total of up to 86 soil gas samples may be collected from the 43 soil gas sampling locations shown on **Figure 4-1**. The boring locations may need to be moved slightly to avoid above ground obstacles and debris. Geoprobe borings may also be terminated before the planned depth and fewer soil gas samples collected if shallow groundwater is encountered, or if the probe encounters significant resistance to pushing as this may indicate the presence of a clay layer.

The soil gas samples will be collected using the Post Run Tubing (PRT) system that utilizes a hollow metal probe driven into the ground with an expendable point using the Geoprobe system. The leading hollow probe rod is fitted with an expendable point holder and an expendable point is then driven to the desired sampling interval. The expendable point holder has a left-hand female threaded opening that accepts an aluminum left-hand threaded tubing adaptor. A required length of 1/4-inch O.D. polyethylene tubing is fitted to the hollow tubing adaptor. The tubing and adaptor are lowered down inside of the probe rods and threaded into the expendable point holder. To assure an air tight seal is maintained, a rubber O-ring is placed between the tubing adaptor and the expendable point holder. As the probe rod string is pulled up a few inches it exposes a cavity of soil from which a representative soil gas sample can be collected. The tubing and cavity are purged of three volumes using a vacuum pump at the surface. A vacuum chamber fitted with a pre-sterilized 0.5 liter Tedlar bag is connected to the sample tubing and evacuated generating negative pressure inside the chamber allowing the bag to fill with soil gas. Soil gas samples should never contact potentially sorbing materials.

Soil gas samples will be collected at each sampled location from a shallow depth (8-10 feet bgs) and deep depth (18-20 feet bgs). The Tedlar bags will be sub-sampled by a sterilized glass syringe to accommodate analytical volume requirements. The sample will then be injected into the gas chromatograph for analysis. More than two injections may be necessary where there are multiple contaminants that required different sample sizes for chromatograph analysis.

Soil gas samples will be analyzed onsite for target VOCs The on-site analyses will allow the geoprobe soil sampling locations to be selected in the field to maximize potential source area identification. One duplicate sample per 15 samples collected will also be analyzed for QA/QC purposes.

After the soil gas sample has been collected, the expendable point remains in the soil and the probe rods are removed from the ground. The hole will then be sealed with granular bentonite, and an asphalt or concrete patch will be used to restore the area to pre-investigation activities, if necessary.

5.2 Geoprobe Soil Samples

5.2.1 Sampling Procedure

A maximum of 30 soil sample locations will be selected based on the results of the soil gas sampling in the northern part of Area 7. Sample locations and depths will be those that showed the highest concentrations of VOCs in soil gas.. Additionally if a probe encounters significant resistance the boring will be terminated and the sample collected. Samples will be sent within 24 hours of collection for TCL VOC analysis by USEPA CLP. Sample collection procedures are summarized as follows:

- The acetate liner containing the soil sample will be placed on a clean surface and cut open following recovery of the sampler from the borehole;
- A zip-lock bag will be half-filled with soil from each sample interval and set aside for several minutes. An organic vapor reading will then be taken from the headspace of the bag using a photoionization detector (PID);
- The lithologic, visual and olfactory characteristics, organic vapor readings as well as the sample depth and identification designation (as described in subsection 3.5.2) will be recorded in the field book;
- The VOC samples designated for analysis will be grab samples. The sample submitted for laboratory analysis must be a separate portion of the sample than the portion used for field screening. Soil samples will be transferred from the liner into laboratory- sterilized sample containers by CDM field samplers wearing surgical gloves using decontaminated stainless steel spatulas, stainless steel scoops, or new plastic syringes (sample containers are listed in **Table 3-1**);
- The sample bottle lids will be securely tightened to the sample jars;
- The exterior of the filled sample jars will be decontaminated as described in Section 6;
- The sample jars will be sealed in a zip-lock bag and immediately placed in an iced cooler.

The previously collected soil gas data will be used to determine the depth and location of samples to be submitted for laboratory analysis of VOCs. The locations with the highest soil gas reading will be sampled first. If 30 soil gas samples do not indicate the presence of VOCs, the soil sample from the water table in selected

borings will be submitted for VOC analysis. It is anticipated that the depth to water in this northern area will vary from 20 feet bgs to as shallow as 5 feet bgs so sample depths may vary. The boring locations will be selected to provide spatial coverage of the entire area shown on the sampling grid in Figure 4-1. The number and distribution of samples may be modified based on field conditions.

5.2.2 Borehole Abandonment

After the soil samples have been collected and the probe removed from the ground, the remaining hole will be backfilled with granular bentonite to six inches below grade, and an asphalt or concrete patch will be used to restore the area to pre-investigation conditions, if necessary. Additional information on sampling equipment and procedures for geoprobe soil sampling is provided in **Appendix B** of this SAP. Additional information on operating procedures for field equipment used is provided in **Appendix C**.

5.3 Geoprobe Groundwater Samples

Groundwater samples will be collected from the sample locations described in Section 4.1.3 and submitted for on-site analysis of target VOCs. One duplicate sample and one field blank sample will be collected and analyzed for QA/QC purposes. All groundwater samples from this area will also be analyzed by USEPA CLP for low detection limit (LDL) TCL VOCs to confirm the on site analyses..

The groundwater samples will be collected using the following procedure:

- A 52-inch long, 1.5-inch diameter stainless steel screen with a 0.004 slot size will be advanced within a sealed Geoprobe® sampling sheath so that the bottom of the screen is approximately fourteen feet below the water table.

- The outer sheath will be retracted to expose the screened interval. The junction between the top of the screen and the outer sheath will be sealed with an O-ring, to ensure that all groundwater enters through the screen.

- A groundwater sample will be extracted from the temporary well using new polyethylene tubing with a decontaminated stainless steel or brass check-valve fastened to the bottom of the tubing. The tubing column will be surged in order to allow water into the tubing, and push this water to the surface for sample collection. The tubing column may be attached to a peristaltic pump at the ground surface to assist lifting of the water column within the tubing.

A minimum of three well volumes of water will be removed from the probe before sampling. A grab sample will be taken at the beginning of purging and after each well volume is removed, and field-tested for turbidity using a turbidimeter. Each grab sample will be also tested for pH, temperature, and specific conductance using a

multi-parameter probe. Parameter readings will be recorded for each volume of water removed. Purging will continue until the following conditions are met:

- Sample turbidity is less than 5 NTU, or varies less than 10 percent over three consecutive measurements.
- Field measurements have stabilized (pH $\pm$ 0.25 standard units, specific conductance $\pm$ 50 umhos/cm, temperature $\pm$ 0.5° C).
- A maximum of five volumes purged from each probe.

The groundwater sample will be collected directly from the discharge tubing into 40-ml vials that are pre-preserved with hydrochloric acid.

USEPA CLP field sampling protocols, chain-of-custody and shipping procedures will be used for groundwater sample collection.

5.4 Monitoring Well Installation and Soil Sampling

Sonic drilling techniques are proposed to advance the monitoring well boreholes. The sonic rig will collect continuous 10-foot soil samples. Each 10-foot sample will be visually separated into two-foot intervals by the field geologist and classified according to the USCS soil classification system. The sample will be field screened at two-foot intervals using a photoionization detector (PID). The sample will also be submitted for analysis of TCL VOCs by USEPA CLP, in order confirm the presence of VOC contaminants.

A hollow-stem auger (HSA) rig may be used to install shallow wells (wells installed in the unconsolidated formation) if it will result in a total cost savings for the drilling work. Two-foot samples will be collected at five-foot intervals during advancement of the HSA boreholes. The soil classification and field screening procedures would be identical to the sonic boreholes. All drilling spoils will be drummed and left at the well site for subsequent transfer to a secure storage area.

Monitoring wells will be constructed of two-inch diameter polyvinyl chloride (PVC). All PVC fittings will be flush threaded and equipped with an O-ring seal to prevent leakage. No cements, external couplings, or collars will be used. The wells will be protected at the surface with a five-inch diameter standpipe cover (a flush-mount cover will be used in wells installed in traffic areas) with a locking cap. The installation of stainless steel wells, as was done in previous investigations at the site, is not recommended due to the high cost. Since 1995, the use of stainless steel wells for chlorinated solvents has been on the decline due to experience showing that PVC wells provide equivalent samples to those provided by stainless steel wells.

5.5 Groundwater Sampling

5.5.1 Monitoring Well Development

The new and existing wells shall be developed by alternately surging water in the screened interval using a surge block, and purging water from the well with a pump. Water will be purged from the well until 10 well volumes are removed or the turbidity of the water has been determined acceptable by CDM site personnel. It is estimated that a minimum of 30 gallons will be evacuated from each existing well. New wells are likely to require additional development. Monitoring wells that have historical data indicating low (less than 50 ppb total VOCs) will be purged directly to the ground surface. For all new wells and wells with historical VOC concentrations greater than 50 ppb total VOCs, all purge water will be drummed and left at the well site for subsequent storage and disposal.

5.5.2 Monitoring Well Sampling

Groundwater samples will be collected from the 25 existing monitoring wells and the three newly installed wells and submitted for USEPA CLP analysis of LDL VOCs. The new wells will also be submitted for USEPA CLP analysis of Target Analyte List (TAL) metals. Each well will be purged using a submersible pump and pump controller capable of operating at low-flow purging rates (500 ml/min or less). The flow rate will be low enough to ensure that the purge water is not visibly agitated, and the turbidity is minimized. Field measurements of pH, dissolved oxygen (DO), temperature, turbidity, and specific conductance will be taken using a multi-parameter probe. The probe will be contained within a flow-through cell, and purge water will be passed through this cell. Parameter readings will be recorded at five-minute intervals. Purging will continue until the following conditions are met:

- Field measurements have stabilized (pH $\pm$ 0.25 standard units, dissolved oxygen 10 percent, specific conductance $\pm$ 50 umhos/cm, turbidity less than 5 NTUs or 10 percent, temperature $\pm$ 0.5° C)
- A maximum of three well volumes have been purged from the well

New pump tubing will be used for each discrete sampling location. The groundwater sample will be collected directly from the pump discharge tubing into pre-preserved sample containers. Samples collected for filtered metals will be filtered using an in-line 45-micron filter connected to the pump discharge tubing. These samples will also be collected in pre-preserved bottles. All groundwater samples will be analyzed by USEPA CLP LDL VOCs. Additionally, the three new monitoring wells will be analyzed by USEPA CLP for TAL metals.

6 Section Six

Section 6
Decontamination Procedures

Procedures to be followed to decontaminate equipment and personnel are fully described in the Area 7 Pre-Design Health and Safety Plan (HASP). The procedures are summarized below.

6.1 Personnel Decontamination

Personnel decontamination stations will be set up at the edge of each study area. Personnel will become thoroughly familiar with the decontamination procedure before work begins in exclusion zones. The exclusion zone will be defined as an area 25 feet surrounding the geoprobe, drilling and groundwater sample collection points. The decontamination procedure is as follows:

- Place equipment and/or samples in segregated equipment drop-areas.
- Remove disposable outer booties (when used).
- Remove chemical resistant outer gloves.
- Remove hard hat, goggles/safety glasses/face shield.
- Remove inner disposable gloves.
- Wash hands and face with water and hand soap.

6.2 Equipment Decontamination

All Geoprobe sampling equipment will be decontaminated prior to use. Between samples, the sampler will be decontaminated. Between boreholes all probe rods, samplers, and other equipment used in the boreholes will be decontaminated. Geoprobe equipment will be decontaminated by scrubbing the equipment in a low-sudsing detergent solution, rinsing the equipment in tap water, and air drying the equipment.

All reusable non-dedicated equipment (scoops, buckets, core samplers, dredges, bottle sampler) will be decontaminated between samples, and before removal from the site. The procedure is given in **Table 6-1**.

6.3 Sample Bottle Decontamination

Sample bottles for shipment to the laboratories will be decontaminated by immersing the bottle up to the neck in soap (Alconox or equivalent) and water solution and then

rinsing with potable or distilled water. Solvents will not be used to wash sample bottles.

Table 6-1
Standard Decontamination Protocol for Sampling Equipment

STEP 1:	Scrub equipment thoroughly with soft-bristled brushes in a low-sudsing detergent solution.
STEP 2:	Rinse equipment with tap water by submerging and/or spraying.
STEP 3:	Rinse equipment with distilled water by spraying until dripping.
STEP 4:	Place equipment on plastic or aluminum foil and allow to air dry for five to ten minutes.
STEP 5:	Wrap equipment in plastic or aluminum foil for handling and/or storage until next use.

NOTE: In order to avoid analytical problems caused by solvent use in decontamination, solvents will not be used for decontamination. Only distilled water shall be used for rinsing equipment. An exception will be made if upon visual observation or high organic vapor readings it is determined that a zone of highly contaminated material is encountered. In such an event, isopropyl alcohol will be used before step 1 above.

6.4 Storage and Disposal of Investigation-Derived Waste

The sampling and drilling activities are expected to generate solid and liquid investigation-derived waste (IDW). Plastic and personal protective equipment (PPE) such as plastic sheeting, tubing, disposable sampling equipment, gloves, and overboots, will also be generated during sampling activities. The activities, the anticipated type and the planned handling of the wastes are summarized below.

- Soil borings: SOLID: To the extent possible, return excess soil cuttings to the borehole after completion of sampling and drum remaining drill cuttings; LIQUIDS: Dispose of decontamination water in 55-gallon DOT-approved drums for subsequent characterization and disposal (same as Liquids below); IDW: Dispose of as common refuse.

- Groundwater Geoprobe purging and sampling: SOLID: None; LIQUIDS: Contain development/purge water in 55-gallon DOT-approved drums for subsequent characterization and disposal; IDW: Dispose of as common refuse

At the end of each day, IDW will be moved to a secure waste storage area designated by Illinois EPA. It is estimated that 32 drums will be required for the purge water and 4 drums for soils. Soil will be analyzed for hazardous waste characteristic parameters, and purge water will be analyzed for parameters in accordance with Illinois EPA's discharge permit with the Rock River Water Reclamation District (RRWRD). The drums will be grouped into eight groups based on past groundwater concentration data. It is assumed that eight samples will be collected, one composite from each drum grouping. Once the data has been received regarding the characterization of the

drummed water, the waste handling subcontractor will be responsible for appropriate disposal of the drum contents. Drums whose contents are determined not to be hazardous will be emptied into a sanitary sewer for ultimate disposal at the RRWRD. Drums with contents determined to be hazardous will be shipped to the appropriate treatment, storage, and disposal (TSD) facility. Illinois EPA will be responsible for signing all manifests for hazardous waste transport and disposal.

7 Section Seven

Section 7
Field Quality Control Procedures

To ensure the level of data quality required for Superfund related sampling events, the following Quality Control (QC) procedures will be performed. QC sample requirements are summarized in **Table 1-1**.

7.1 Soil and Groundwater QC Samples

7.1.1 Field Duplicates

Duplicate samples will be collected as follows:

- One duplicate soil sample for every 10 samples (or portion thereof) collected in the field. It may not be possible to collect a field duplicate during monitoring well installation due to poor sample recovery.
- One duplicate groundwater sample for every 10 samples (or portion thereof) collected in the field.
- One duplicate soil gas sample for every 15 samples (or portion thereof) collected in the field.

7.1.2 Field Blanks

One field blank water sample will be prepared for every ten groundwater samples collected. Field blanks will be prepared by filling water sample bottles with reagent-grade distilled water from the sampling device (if possible), at the same volume as the groundwater samples. Sample bottles for all parameters will be prepared. These samples will be prepared in close proximity to an actual sample location. This location will be recorded in the sample field log book.

One field blank soil gas sample will be prepared and analyzed for every 15 soil gas samples as per the soil gas sampling procedure.

7.1.3 Trip Blanks

A trip blank for volatile organic analysis (VOA) will be included in each cooler containing aqueous samples for VOC organic analysis. The trip blank will consist of four 40-ml VOA vials filled with reagent-grade distilled water. The trip blank will be prepared in the office or laboratory, transported to the field, and shipped with the other samples to the CLP without being opened. The trip blank will be documented on a traffic report form for shipment to the CLP designated laboratory.

7.1.4 Rinsate Blanks

One rinsate blank for soil sampling equipment will be collected at the end of each day of sampling. Rinsate blanks will be prepared by pouring laboratory grade distilled/deionized water over the decontaminated non-dedicated geoprobe sampling equipment, and then collecting the water in the sample containers. The sample containers and sample volume will be the same as a groundwater sample or field blank. The FM or STL will record the sample location that preceded collection of the rinsate blank in the field log book.

7.1.5 Matrix Spike and Matrix Spike Duplicates

All samples designated as MS/MSD samples will be collected as specified in the USEPA Region V Sample Handling Manual. Matrix spike samples will be denoted by the sample number followed by an -MSD suffix on sample tags and TR/COC forms.

Soil samples collected for VOC MS/MSD analysis will be collected at double volume at a frequency of one per 20 samples. Groundwater samples will be designated for MS/MSD analysis at a frequency of one per 20 samples. Double sample volume is required for both soil and groundwater volatile samples. MS/MSD samples will be selected from areas where contamination is known or suspected, if possible.

8 Section Eight

Section 8
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